RS-FSXCS-N01-*-EX

Ultrasonic integrated weather station user's manual

Document version:V1.6

Catalog

1. Product introduction

1.1 Product overview

The integrated weather station can be widely used in environmental detection, integrating wind speed, wind direction, temperature and humidity, noise collection, PM2.5 and PM10, CO2, atmospheric pressure, and light. The equipment adopts standard MODBUS-RTU communication protocol and RS485 signal output , the longest communication distance is up to 2000 meters, and the data can be uploaded to the customer's monitoring software or PLC configuration screen through 485 communication, and it also supports secondary development.

With the built-in electronic compass selection device, orientation is no longer required during installation, just ensure horizontal installation. It is suitable for use in mobile occasions such as marine ships and automobile transportation. There is no direction requirement during installation.

This product is widely used in various occasions that need to measure environmental temperature and humidity, noise, air quality, CO2, atmospheric pressure, light, etc. It is safe and reliable, beautiful in appearance, easy to install, and durable.

1.2 Function features

This product is with small size and light weight, made of high-quality anti-ultraviolet materials, it have long service life, high-sensitivity probe, stable signal and high precision. The key components adopt imported components, which are stable and reliable, and have the characteristics of wide measurement range, good linearity, good waterproof performance, convenient use, easy installation, and long transmission distance.

- The integrated design of multiple collection devices is adopted, which is easy to install.
- Wind speed and direction are measured by ultrasonic principle, no start-up wind speed limit, zero wind speed operation, no angle limit, 360° omnidirectional, wind speed and wind direction data can be obtained at the same time.
- Noise collection, accurate measurement, range up to 30dB~130dB.
- PM2.5 and PM10 are collected at the same time, range: 0-1000ug/m^3, resolution 1μg/m^3, unique dual-frequency data collection and automatic calibration technology, consistency can reach ±10%.
- CO2 range: 0-5000ppm, resolution 1ppm.
- Measuring the environmental temperature and humidity, the measuring unit is imported from Switzerland, and the measurement is accurate.
- Wide range 0-120Kpa air pressure range, applicable to various altitudes.
- Using dedicated 485 circuit, the communication is stable.
- With built-in electronic compass, no direction requirement when installing, just install it

horizontally.

1.3 Main technical parameter

DC power supply (default)	10-30VDC	
Maximum power consumption	RS485 output	1.2W
Precision	Wind speed	±(0.2m/s±0.02*v) (v is the real wind speed) (60%RH,25℃)
	Wind direction	±3°(60%RH,25℃)
	Humidity	±3%RH(60%RH,25℃)
	Temperature	±0.5℃(25℃)
	Atmospheric pressure	±0.15Kpa@25℃ 101Kpa
	Noise	±0.5dB (at reference pitch, 94dB@1kHz)
	PM2.5	Particle counting efficiency: 50%@0.3μm, 98%@>=0.5μm. PM2.5 precision: ±3%FS(@100μg/m^3, 25℃, 50%RH)
	CO2	±(50ppm+ 3%F·S) (25℃)
	Light intensity	±7%(25℃)
	Total solar radiation	≤±3%@150W/m^2
Range	Wind speed	0~60m/s
	Wind direction	0~359°
	Humidity	0%RH~99%RH
	Temperature	-40℃~+80℃
	Atmospheric pressure	0~120Kpa
	Noise	30dB~120dB
	PM10 PM2.5	0~1000μg/m^3
	CO2	0~5000ppm
	Light intensity	0~200,000 Lux
	Total solar radiation	0~1,800W/m^2
Long term stability	Temperature	≤0.1℃/y
	Humidity	≤1%/y
	Atmospheric pressure	-0.1Kpa/y
	Noise	≤3dB/y
	PM10 PM2.5	≤1%/y
	CO2	≤1%/y
	Light intensity	≤5%/y
	Total solar radiation	≤±3%
Response time[1]	Wind peed	1s

	Wind direction	1s
	Temperature	≤25s(1m/s wind speed[2])
	Humidity	≤8s(1m/s wind speed[2])
	Atmospheric pressure	≤2s
	Noise	≤3s
	PM10 PM2.5	≤90s
	CO2	≤90s
	Light intensity	≤2s
	Total solar radiation	≤10s
Optical rainfall parameter	Typical precision	±5%(Data from Renke LABS)
	Resolution	Standard 0.1mm
	Maximum instantaneous rainfall	24mm/min
	Rain-sensitive diameter	6cm
Output signal	RS485 output	RS485 (standard Modbus communication protocol)

The performance data stated above were obtained under test conditions using our test system and software. In order to continuously improve the product, we reserve the right to change the design features and specifications without prior notice.

[1] Response time is τ63 time.

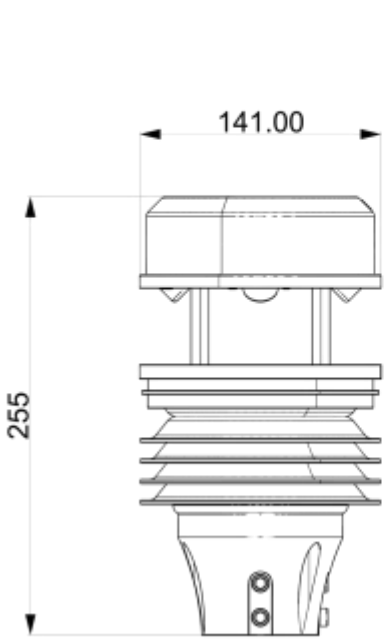
[2] Wind speed refers to the wind speed at the sensitive material inside the sensor. When the test environment wind speed is 10-2m/ms, the wind direction is perpendicular to the sensor acquisition port, and the wind speed at the sensitive material inside the sensor is about 1m/s.

1.4 Product model

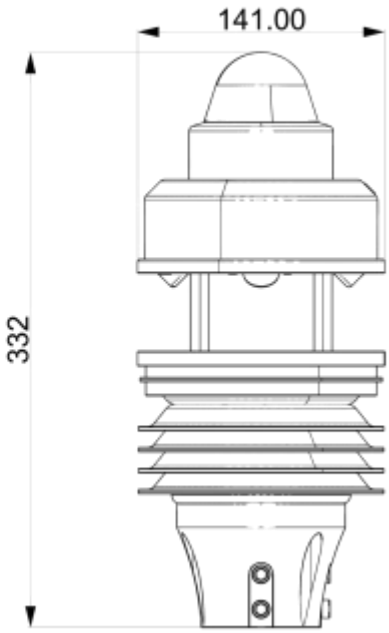
RS-					Company code
	FSXCS-				Ultrasonic integrated weather station
		N01-			485 communication (standard Modbus-RTU protocol)
			1-		ABS shell
			1H-		Premium appearance
				none	No built-in electronic compass
				CP	Built-in electronic compass function
				EX	Export product

Note: If PM element is selected, CO2 element cannot be selected, these two elements cannot be selected at the same time.

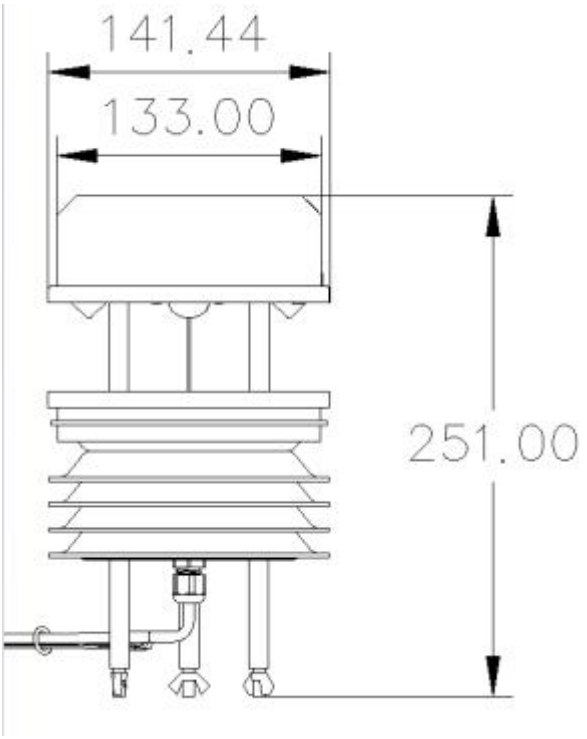
2. Equipment size



-1H device dimension drawing(unit: mm)



-1H device with optical rain elements dimension drawing(unit: mm)



-1 Equipment dimension drawing (unit: mm)

3. Equipment installation instructions

3.1 Inspection before equipment installation

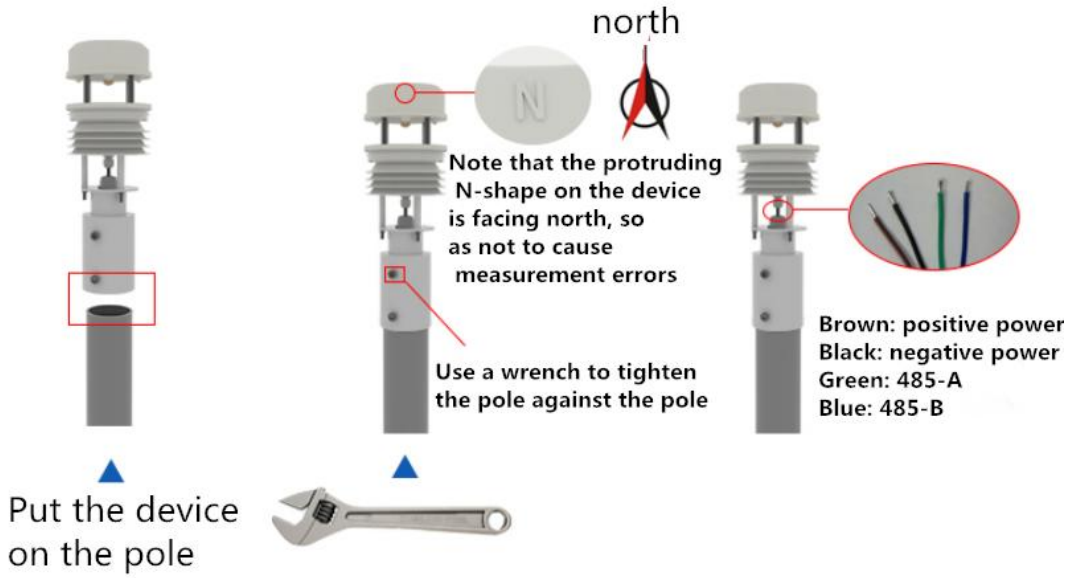
Equipment List:

- One integrated weather station equipment
- Warranty card, certificate of conformity
- A pack of mounting screws(-01 model selection components)
- 1pc hex wrench(-3H select model components)

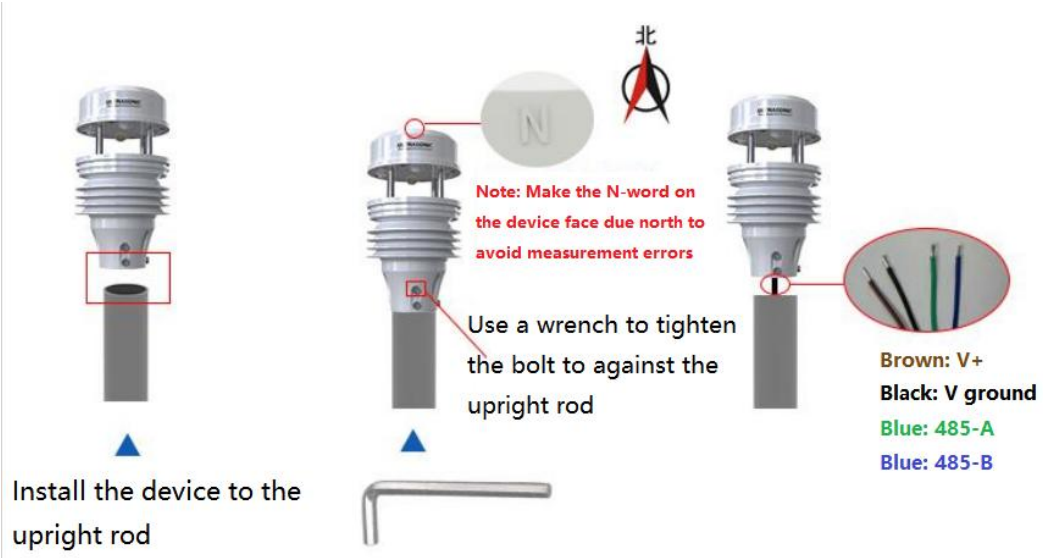
3.2 Installation method

The installation of equipment without electronic compass is shown in the figure below, and equipment with built-in electronic compass only needs to be installed horizontally.

Hugging seat installation:



-1 model selection installation mode



-1H model selection mode

3.3 Interface Description

DC 10~30V power supply. When wiring the 485 signal line, pay attention to the two wires

A/B not to be reversed, and the addresses of multiple devices on the bus cannot be conflicted.

	Thread color	Description
Power supply	brown	Positive power supply (10-30V DC)
	black	Negative power supply
Communication	yellow(green)	485-A
	blue	485-B

3.4 485 Field wiring instructions

When multiple 485 devices are connected to the same bus, there are certain requirements for field wiring. For details, please refer to the "485 Device Field Wiring Manual" in the information package.

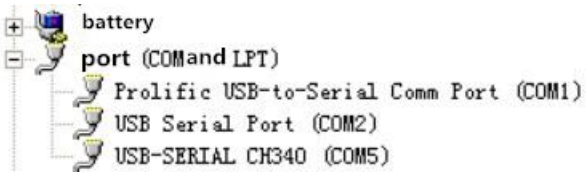
4. Configuration software installation and use

4.1 Software selection

Open the data package, select "Debugging Software" --- "485 Parameter Configuration Software", find "485 Parameter Configuration To ol" and just open it.

4.2 Parameter settings

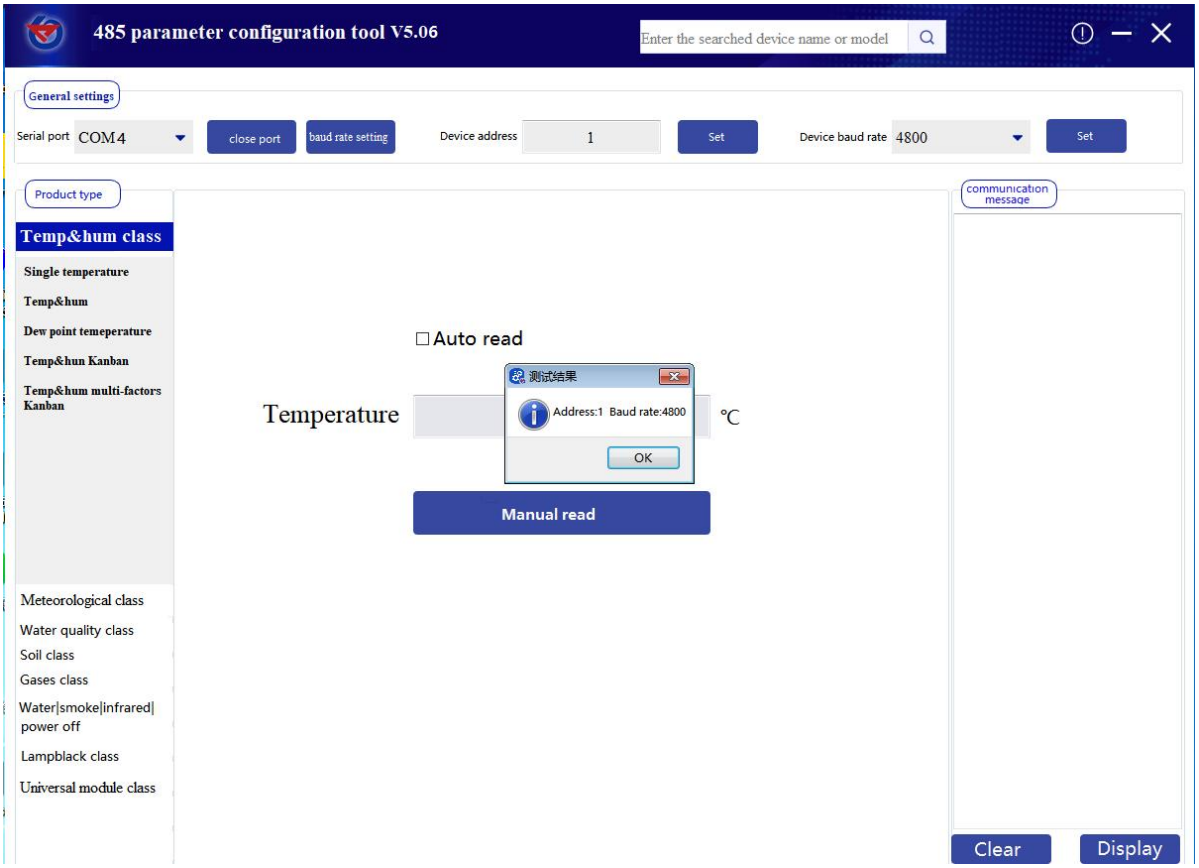
① Select the correct COM port (check the COM port in "My Computer—Properties—Device Manager—Port"). The following figure lists the driver names of several different 485 converters.



② Connect only one device alone and power it on, click the test baud rate of the software, the software will test the baud rate and address of the current device, the default baud rate is 4800bit/s, and the default address is 0x01.

③. Modify the address and baud rate according to the needs of use, and at the same time query the current function status of the device.

④. If the test is unsuccessful, please recheck the equipment wiring and 485 driver installation.



5. Communication protocol

5.1 Basic communication parameters

Code	8-bit binary
Data bit	8-bit
Parity bit	no
Stop bit	1-bit
Error checking	CRC (Cyclic Redundant Code)
Baud rate	2400bit/s, 4800bit/s, 9600 bit/s can be set, the factory default is 4800bit/s

5.2 Data frame format definition

Using Modbus-RTU communication protocol, the format is as follows:

Initial structure ≥ 4 bytes time

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

Time to end structure ≥ 4 bytes

Address code: the starting address of the transmitter, which is unique in the communication network (factory default 0x01).

Function code: the command function instruction issued by the host, this transmitter only uses function code 0x03 (read register data).

Data area: The data area is the specific communication data, pay attention that the high byte of 16bits data are in front!

CRC code: two-byte check code.

Host query frame structure:

Address code	Function code	Register start address	Register length	Check code low byte	Check code high byte
1byte	1byte	2byte	2byte	1byte	1byte

Slave machine response frame structure:

Address code	Function code	Effective bytes number	Data area 1	Data area two	Data N area	Check code low byte	Check code high byte
1byte	1byte	1byte	2byte	2byte	2byte	1byte	1byte

5.3 Communication register address description

The contents of the register are shown in the following table (support 03/04 function code):

Register address	PLC or configuration address	Content	Support function code	Definition description
500	40501	Wind speed value	0x03/0x04	100 times the actual value
501	40502	Wind force	0x03/0x04	Actual value(Wind level value corresponding to current wind speed)
502	40503	Wind direction (0-7 grade)	0x03/0x04	Actual value (0 for true north, increase the value clockwise, 2 for true east)
503	40504	Wind direction (0-360°)	0x03/0x04	Actual value (the direction of true north is 0° and the degree increases clockwise, and the direction of true east is 90°)
504	40505	Humidity value	0x03/0x04	10 times the actual value
505	40506	Temperature value	0x03/0x04	10 times the actual value
506	40507	Noise value	0x03/0x04	10 times the actual value
507	40508	PM2.5 value	0x03/0x04	Actual value
508	40509	PM10 value	0x03/0x04	Actual value
509	40510	Atmospheric pressure value (unit Kpa,)	0x03/0x04	10 times the actual value

510	40511	20W Lux value high 16-bit value	0x03/0x04	Actual value
511	40512	20W Lux value low 16-bit value	0x03/0x04	Actual value
512	40513	20W radiation value (unit: hundred Lux)	0x03/0x04	Actual value
513	40514	Optical rainfall rainfall value	0x03/0x04	10 times of actual value
515	40516	Total radiation value	0x03/0x04	Actual value

5.4 Communication protocol example and explanation

5.4.1 Example: Read the real-time wind speed value of the transmitter device (address 0x01)

Inquiry frame

Address code	Function code	Starting address	Data length	Check code low bit	Check code high bit
0x01	0x03	0x01 0xF4	0x00 0x01	0x C4	0x04

Reply frame

Address code	Function code	Returns the number of valid bytes	Wind speed value	Check code low bit	Check code high bit
0x01	0x03	0x02	0x00 0x7D	0x78	0x65

Real-time wind speed calculation:

Wind speed: 007D (hexadecimal) = 125 => wind speed = 1.25 m/s

5.4.2 Example: Read the wind direction value of the transmitter device (address 0x01)

Inquiry frame

Address code	Function code	Starting address	Data length	Check code low bit	Check code high bit
0x01	0x03	0x01 0xF6	0x00 0x01	0x65	0xC4

Reply frame

Address code	Function code	Returns the valid bytes number	Wind direction value	Check code low bit	Check code high bit
0x01	0x03	0x02	0x00 0x02	0x39	0x85

Wind direction calculation:

Wind direction: 0002 (hexadecimal) = 2 => wind direction = east wind

5.4.3 Example: Read the temperature and humidity value of the transmitter device (address 0x01)

Inquiry frame

Address code	Function code	Starting address	Data length	Check code low bit	Check code high bit
0x01	0x03	0x01 0xF8	0x00 0x02	0x44	0x06

Response frame (for example, the temperature is -10.1℃ and the humidity is 65.8%RH)

Address code	Function code	Effective bytes	Humidity value	Temperature value	Check code low bit	Check code high byte
0x01	0x03	0x04	0x02 0x92	0xFF 0x9B	0x5A	0x3D

Temperature: when the temperature is lower than 0℃, upload in the form of complement

0xFF9B (Hexadecimal) = -101 => Temperature = -10.1℃

humidity:

0x0292 (hexadecimal) = 658 => humidity = 65.8%RH

6.Common problems and solutions

The device cannot connect to the PLC or computer

possible reason:

1) The computer has multiple COM ports, and the selected port is incorrect.

2) The device address is wrong, or there are devices with duplicate addresses (the factory default is all 1).

3) The baud rate, check method, data bit and stop bit are wrong.

4) The host polling interval and waiting response time are too short, and both need to be set above 200ms.

5) The 485 bus is disconnected, or the A and B wires are connected reversely.

6) If the number of equipment is too large or the wiring is too long, power should be supplied nearby, and a 485 booster should be added and a 120Ω terminal resistance should be added.

7) The USB to 485 driver is not installed or damaged.

8) The equipment is damaged.

Note:To ensure the accuracy of the device, clean the lower surface of the measurement area regularly and keep it clean and free of dust or other foreign bodies

7. Contact details

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Shandong Renke Control Technology Co.,Ltd
Official website

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8. Document History

V1.0 Document creation

V1.1 Add electronic compass

V1.2 Add lighting

V1.3 Modification of maximum power consumption

V1.4 Change the temperature range from -40℃~+120℃ to -40℃~+80℃

V1.5 Parameter update

V1.6 Add -1H model selection